

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
(Attorney Docket № 17474US02)**

In the Application of:

Akira Yamanaka, et al.

Serial No. 10/773,804

Filed: February 6, 2004

For: METHOD AND SYSTEM FOR
MEASURING IQ PATH MISMATCH

Examiner: Emmanuel Bayard

Group Art Unit: 2611

Confirmation No. 8463

Electronically Filed on 10-NOV-2008

REPLY BRIEF

MS: APPEAL BRIEF-PATENTS
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with 37 CFR 41.41, the Appellant submits this Reply Brief in response to the Examiner's Answer mailed on September 17, 2008. Claims 1-23 are pending in the present Application. The Appellant has responded to the Examiner in the Examiner's Answer, as found in the following Argument section.

As may be verified in his final Office Action (page 2), dated 1/7/2008 ("Final Office Action"), the present application includes claims 1-23, which are pending in the present application. Claims 1-2, 5-8, 11-13, 18-19, and 22-23 stand rejected under 35

U.S.C. § 102(e) as being anticipated by U.S. Patent No. 7,155,180, issued to Kim, et al. (hereinafter, Kim). See Final Office Action at page 2. Claims 3-4, 9-10, 14-17, and 20-21 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kim, in view of U.S. Patent Application Publication No. 2004/0203472, issued to Chien (hereinafter, Chien). See *id.* at page 4.. To aid the Board in identifying corresponding arguments, the Appellant has used the same headings in the Argument section of this Reply Brief as the headings found in the Appellant's corresponding Brief on Appeal. The Brief on Appeal has a date of deposit of June 27, 2008.

STATUS OF THE CLAIMS

Claims 1-23 were finally rejected. Pending claims 1-23 are the subject of this appeal.

ARGUMENT

I-A and B. Rejection of Independent Claims 1, 7, and 18 under 35 U.S.C. § 102(e)

The Appellant stands by the argument made in the corresponding section of the Brief on Appeal.

In response to Appellant's Brief on Appeal, the Examiner is using the following argument stated on page 7 of the Examiner's Answer:

In pages 7-9 appellant argues that Kim does not teach or suggest at least the limitation of "estimating a transmitter IQ mismatch in a form of gain and phase response for transmitter I and Q paths sharing a receiver path," as recited by the Appellant in independent claims 1, 7 and 18. Examiner respectfully disagrees.

As shown in fig.9 of Kim "estimating a transmitter IQ mismatch in a form of gain and phase response for transmitter I and Q paths sharing a receiver path," is clearly taught. The Mismatch estimation TX box in fig.9 of Kim is receiving its inputs from the output of mixers II and IQ which generate gain and phase. These gain and phase are being utilized by the transmitter to estimate a mismatch. Therefore appellant's arguments are moot and this case stand rejected as stated in the final office action dated 1/7/08.

The Appellant respectfully disagrees that FIG. 9 of Kim teaches the above limitation. Initially, the Appellant points out that II and IQ are not mixers, as stated by the Examiner, but they are the outputs of the in-phase mixer group of the receiver in FIG. 9. Even though Kim's TX Mismatch Estimation block receives inputs II and IQ from the receiver in-phase mixer group, the Applicant points out that this is not relevant in the present case. The relevant claim limitation recited in Appellant's claim 1 is "I and Q paths sharing a receiver path." As clearly seen in Kim's FIG. 9 (and as clarified in Appellant's Appeal Brief), the transmitter I and Q paths do **not** share any of Kim's

receiver paths. Furthermore, the I and Q signals generated at the receiver output (and based on the received signal) are obviously not the same as the I and Q signals received at the transmitter input (based on the transmit signal). Therefore, the Appellant maintains that Kim does not teach or suggest at least the limitation of "estimating a transmitter IQ mismatch in a form of gain and phase response for transmitter I and Q paths sharing a receiver path," as recited by the Appellant in independent claims 1, 7 and 18.

The Appellant respectfully submits that independent claims 1, 7, and 18 are allowable.

I-C. Rejection of Dependent Claims 2, 8, and 19

The Appellant stands by the argument made in the corresponding section of the Brief on Appeal.

In response to Appellant's Brief on Appeal, the Examiner is using the following argument stated on pages 7-8 of the Examiner's Answer:

In page 10, appellant argues that Kim does not teach "signal to be a predetermined value. However, Kim does not disclose any measuring of a difference in the gain and phase response between the transmitter I and Q paths and between the receiver I and Q paths for purposes of estimating a transmitter IQ mismatch and a receiver IQ mismatch" as recited in claims 2, 8 and 19. Examiner respectfully disagrees.

As disclosed in Kim col.9, lines 40-45 and col.14, lines 27-30 a phase difference between the In-phase and quadrature components are calculated. This calculation is derived from the gain and phase compensation values acquired from the sum of square values of the I and Q component (see col.9, lines 43-44) therefore the claimed limitations are taught by Kim and this case stand rejected as stated in the final office action dated 1/7/08.

The Appellant disagrees. The Applicant points out that Kim's mismatch estimating means performs mismatch estimation based on a determination of whether a sum of square values of the in-phase and the quadrature-phase components is minimized. See Kim at col. 14, lines 15-23. The Examiner, in the above citation, has relied on col. 14, lines 27-30. However, col. 14, lines 27-30 relates to mismatch compensation and **not** mismatch estimation. Furthermore, neither col. 9 nor col. 14 of Kim discloses that "the estimating of a transmitter IQ mismatch and the estimating of a receiver IQ mismatch comprises measuring a difference in the gain and phase response between the transmitter I and Q paths and between the receiver I and Q paths," as recited in claims 2, 8, and 19.

The Appellant respectfully submits that dependent claims 2, 8, and 19 are allowable.

I-D. Rejection of Dependent Claims 5, 11, and 22

The Appellant stands by the argument made in the corresponding section of the Brief on Appeal.

In response to Appellant's Brief on Appeal, the Examiner is using the following argument stated on page 8 of the Examiner's Answer:

In page 11, appellant argues that Kim does not teach compensating for the difference of transmitter and receiver I and Q paths is achieved by using a digital FIR filter as recited in claims 5, 11 and 22. Examiner respectfully disagrees.

As disclosed in Kim col. 10, lines 25-26 the compensation mismatch is performed by a digital filter. Note that the mismatch compensation is used in the receiver and transmitter portions to determine the phase and

gain difference therefore the claimed limitations are taught by Kim and this case stand rejected as stated in the final office action dated 1/7/08.

The Appellant disagrees. The Examiner has not provided any substantive response and continues to rely on the same arguments and citations used in the Final Office Action, which were already addressed by the Appellant in the Appeal Brief. Furthermore, the Examiner has not responded to the Appellant's argument regarding traversal of inherency.

The Appellant respectfully submits that dependent claims 5, 11, and 22 are allowable.

I-E. Rejection of Dependent Claims 6, 12, and 23

The Appellant stands by the argument made in the corresponding section of the Brief on Appeal.

In response to Appellant's Brief on Appeal, the Examiner is using the following argument stated on page 8 of the Examiner's Answer:

In page 13 appellant argues that Kim does not teach "utilizing iterative estimation for filter tap parameters during the compensating," as recited in claims 6, 12 and 23. Examiner respectfully disagrees.

As disclosed in col. 10, lines 25-34, the mismatch compensation is performed in a digital filter using adjust coefficient of filter. It is well Known and documented in the art that digital filter is functionally equivalent to both FIR filter and equalizer. These FIR filter and equalizer are also both well known to perform feedback estimation using filter tap coefficients therefore the claimed limitations are inherently met by Kim and this case stand rejected as stated in the final office action dated 1/7/08.

The Appellant disagrees. The Examiner has not provided any substantive response and continues to rely on the same arguments and citations used in the Final Office

Action, which were already addressed by the Appellant in the Appeal Brief. Furthermore, the Examiner has not responded to the Appellant's argument regarding traversal of inherency, and has not provided any support that Kim discloses any iterative estimation for filter tap parameters. The Appellant respectfully submits that dependent claims 6, 12, and 23 are allowable.

I-F. Rejection of Independent Claim 13

The Appellant stands by the argument made in the corresponding section of the Brief on Appeal.

In response to Appellant's Brief on Appeal, the Examiner is using the following argument stated on pages 8-9 of the Examiner's Answer:

In page 15, appellant argues that Kim does not teach "measuring a difference in the gain and phase response between transmitter I and Q paths and between receiver I and Q paths of a transceiver, the transmitter I and Q paths sharing a receiver path and the receiver I and Q paths sharing a signal source," as recited by the Appellant in claim 13. Examiner respectfully disagrees.

Claim 13 falls under the rational as disclosed in section C above and col.9, lines 40-48 and col. 14, lines 27-30 of Kim.

The Appellant disagrees. The Applicant points out that Kim's mismatch estimating means performs mismatch estimation based on a determination of whether a sum of square values of the in-phase and the quadrature-phase components is minimized. See Kim at col. 14, lines 15-23. The Examiner, in the above citation, has relied on col. 14, lines 27-30. However, col. 14, lines 27-30 relates to mismatch compensation and **not** mismatch estimation. Furthermore, neither col. 9 nor col. 14 of Kim discloses that

“measuring a difference in the gain and phase response between transmitter I and Q paths and between receiver I and Q paths of a transceiver,” as recited in claims 2, 8, and 19. In addition, as already explained in Section I-A above, Kim does not disclose “the transmitter I and Q paths sharing a receiver path and the receiver I and Q paths sharing a signal source.”

The Appellant respectfully submits that independent claim 13 is allowable.

II-A. Rejection of Dependent Claims 3 and 9

The Appellant stands by the argument made in the corresponding section of the Brief on Appeal.

In response to Appellant's Brief on Appeal, the Examiner is using the following argument stated on page 9 of the Examiner's Answer:

In pages 16-18 appellant argues that the combination of Kim and Chien does not Render claims 3 and 9 unpatentable and that Kim alone does not teach any measuring of power. Examiner respectfully disagrees.

As disclosed in Kim the sum of square values of the I and Q component (see col.9, lines 43-44) is well known in the art as process to determine power measurement or signal strength measurement or signal quality measurement. In response to applicant's argument that the tone signal disclosed by Chien is used for local calibration, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58,60 (Bd. Pat. App. & Inter. 1985).

The Appellant disagrees. The Examiner conceded that the above limitation is not disclosed by Kim, and then he relies for support on Chien. However, as explained in pages 17-18 of the Appeal Brief, Chien's tone is simply a local calibration signal, and it

is not used for purposes of measuring power and phase shift for desired frequency points, as recited in Appellant's claims 3 and 9.

The Appellant respectfully submits that dependent claims 3 and 9 are allowable.

II-B. Rejection of Dependent Claims 4 and 10

The Appellant stands by the argument made in the corresponding section of the Brief on Appeal.

In response to Appellant's Brief on Appeal, the Examiner is using the following argument stated on pages 9-10 of the Examiner's Answer:

In pages 18-19, appellant argues that the combination of Kim and Chien does not disclose the limitations of claims 4 and 10 "wherein the measuring comprises sending uniformly spaced multi-tone white signals, taking a fast Fourier transform (FFT) of a unit period of the uniformly spaced multi-tone white signals, and calculating the response from a power and phase of each tone". However Chein teaches a FFT (see paragraph [0118-0119] that should be set such that the transmitted tones fall on the center of the frequency bins of the FFT and where the weighting factors which is functionally equivalent to measuring power and phase shift, are set to zero based on transmitted tone. Therefore combining such teaching with Kim is similar and functionally equivalent the claimed limitations and this rejection stand as stated in the final office action.

The Appellant disagrees. The Examiner conceded that the above limitation is not disclosed by Kim, and then he relies for support on Chien. However, as explained in pages 18-20 of the Appeal Brief, Chien does not even disclose the use of any multi-tone white signals. Chien also does not disclose that measuring a difference in the gain and phase response includes sending uniformly spaced multi-tone white signals, taking a fast Fourier transform (FFT) of a unit period of the uniformly spaced multi-tone white

signals, and calculating the response from a power and phase of each tone, as recited in Appellant's claims 4 and 10.

The Appellant respectfully submits that dependent claims 4 and 10 are allowable.

II-C. Rejection of Dependent Claims 14-15 and 20-21

The Appellant stands by the argument made in the corresponding section of the Brief on Appeal.

In response to Appellant's Brief on Appeal, the Examiner is using the following argument stated on page 10 of the Examiner's Answer:

In pages 20-21, appellant argues that the combination of Kim and Chien does not disclose the limitations of claims 14-15 and 20-21 "wherein the measuring comprises sending uniformly spaced multi-tone white signals, taking a fast Fourier transform (FFT) of a unit period of the uniformly spaced multi-tone white signals, and calculating the response from a power and phase of each tone". However Chein teaches a FFT (see paragraph [0118-0119] that should be set such that the transmitted tones fall on the center of the frequency bins of the FFT and where the weighting factors which is functionally equivalent to measuring power and phase shift, are set to zero based on transmitted tones. Therefore combining such teaching with Kim is similar and functionally equivalent to the claimed limitations and this rejection stand as stated in the final office action.

The Appellant disagrees. The Examiner conceded that the above limitation is not disclosed by Kim, and then he relies for support on Chien. However, as explained in pages 20-21 of the Appeal Brief, Chien does not even disclose the use of any multi-tone white signals. Chien also does not disclose that measuring a difference in the gain and phase response includes sending uniformly spaced multi-tone white signals, taking a

fast Fourier transform (FFT) of a unit period of the uniformly spaced multi-tone white signals.

The Appellant respectfully submits that dependent claims 14-15 and 20-21 are allowable.

II-D. Rejection of Dependent Claim 16

The Appellant stands by the argument made in the corresponding section of the Brief on Appeal.

In response to Appellant's Brief on Appeal, the Examiner is using the following argument stated on page 10 of the Examiner's Answer:

In pages 21-23, appellant argues that the combination of Kim and Chien does not disclose the limitations "wherein the compensating comprises utilizing iterative estimation for filter tap parameters". However as disclosed in col. 10, lines 25-34 of Kim, the mismatch compensation is performed in a digital filter using adjust coefficient of filter. It is well Known and documented in the art that digital filter is functionally equivalent to both FIR filter and equalizer. These FIR filter and equalizer are also both well known to perform feedback estimation using filter tap coefficients therefore the claimed limitations are inherently met by Kim. Therefore combining such teaching is similar and functionally equivalent to the claimed limitations and this rejection stand as stated in the final office action.

The Appellant disagrees. The Examiner has not provided any substantive response and continues to rely on the same arguments and citations used in the Final Office Action, which were already addressed by the Appellant in the Appeal Brief. Furthermore, the Examiner has not responded to the Appellant's argument regarding traversal of inherency, and has not provided any support that Kim discloses any iterative estimation for filter tap parameters.

The Appellant respectfully submits that dependent claim 16 is allowable.

II-E. Rejection of Dependent Claim 17

The Appellant stands by the argument made in the corresponding section of the Brief on Appeal.

The Appellant respectfully submits that dependent claim 17 is allowable.

CONCLUSION

The Appellant submits that the pending claims are allowable in all respects. Reversal of the Examiner's rejections for all the pending claims and issuance of a patent on the Application are therefore requested from the Board.

The Commissioner is hereby authorized to charge additional fee(s) or credit overpayment(s) to the deposit account of McAndrews, Held & Malloy, Account No. 13-0017.

Respectfully submitted,

Date: 10-NOV-2008

By: /Ognyan I. Beremski/
Ognyan Beremski, Reg. No. 51,458
Attorney for Appellant

McANDREWS, HELD & MALLOY, LTD.
500 West Madison Street, 34th Floor
Chicago, Illinois 60661
Telephone: (312) 775-8000
Facsimile: (312) 775 – 8100

(OIB)